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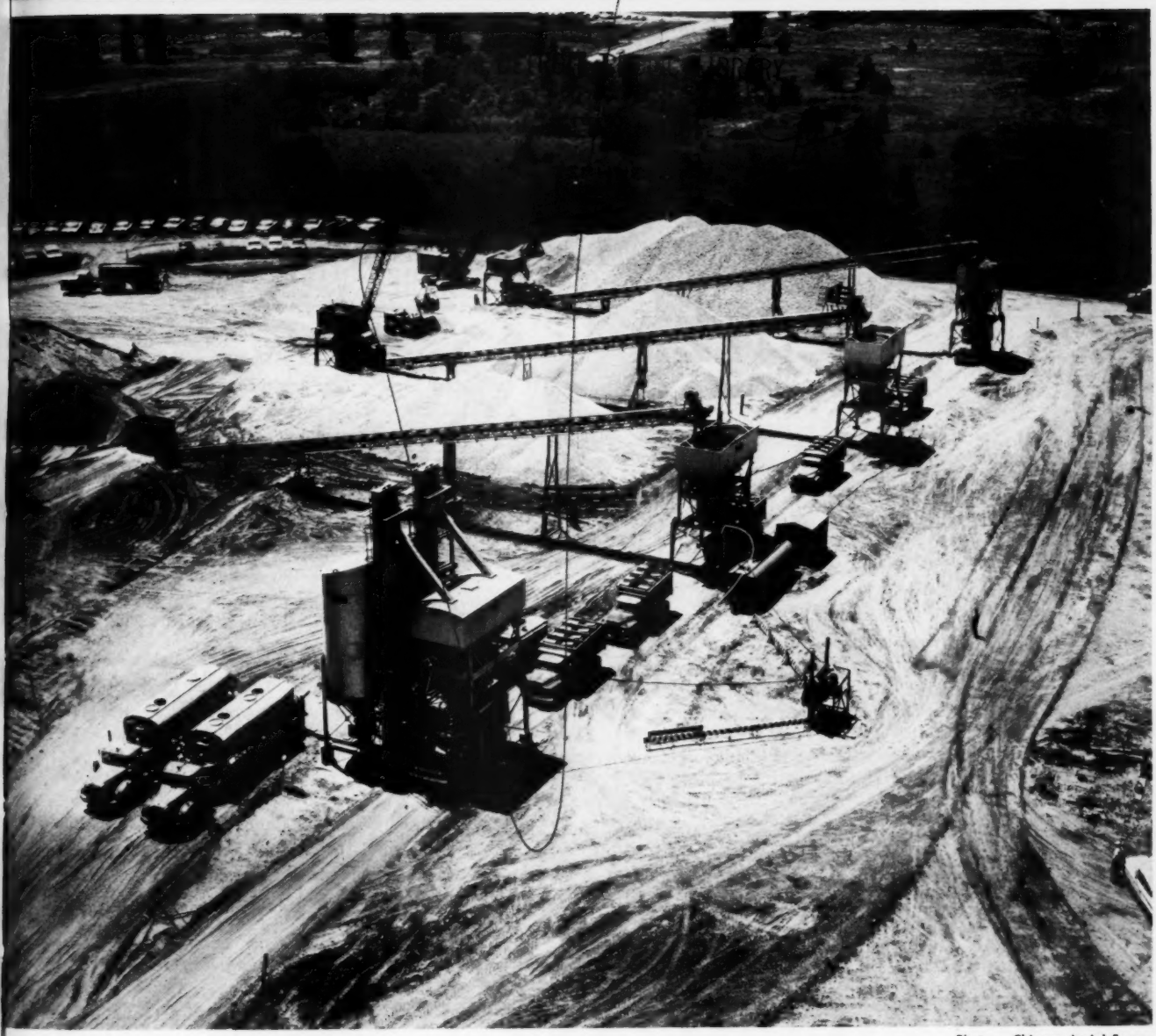

Photo — Chicago Aerial Survey

Cover Picture: AUTOMATIC BATCH MILL
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Engineers Help to Develop Better
Heart Surgery Equipment ..... Page 18

February 1961
Vol. 13 No. 6

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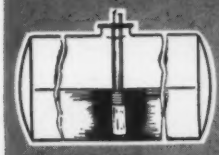

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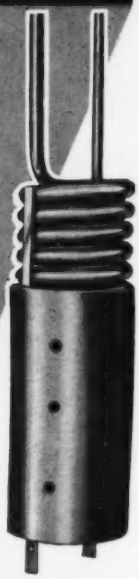

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THIS MONTH'S FEATURES

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Midwest Engineer

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MIDWEST ENGINEER is published monthly except June, July and August by the Western Society of Engineers at 84 East Randolph Street, Chicago 1, Illinois. Entered as second class matter at the Post Office at Chicago, Illinois, under the Act of March 3, 1879. Single copy, $.50; annual subscription, $4.00; foreign subscription, $6.00. The Society does not assume responsibility for statements and opinions in articles, papers, and discussions appearing herein.

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Kahler to Receive Washington Award for 1961 at Dinner March 2nd

WILLIAM V. KAHLER, president Illinois Bell Telephone Co., Chicago, will be the recipient of the Washington Award for 1961 at the annual award dinner to be held at the Furniture Club of America on March 2nd. His interest in the public welfare, his service to the government during the last war, and his many contributions to advancing the engineering profession have been outstanding.

He received a B. S. degree in Mechanical Engineering from the University of Missouri in 1922. He started in the telephone business with Bell Telephone Laboratories in New York after graduation. Two years later he transferred to Illinois Bell. In 1930 he returned to New York to join A.T. & T. He became chief engineer with Illinois Bell in 1938. After being "on loan" to federal government agencies during 1940-43 he returned to Illinois Bell. Advancing rapidly, he became president in 1951.

He served as president of the Western Society of Engineers from 1947-1948. He was 1953 chairman of the Community Fund of Chicago and an early supporter of Junior Achievement and past president of Telephone Pioneers of America, 1958-1959.

IS IT THE PROPER THING TO DO?

NOTE: This column deals with standards of conduct in the engineering field. The editor invites comments and criticisms on the ethical problems considered herein. Questions submitted on engineering ethics will be given careful attention. You should address your letter: The Editor, Midwest Engineer, 84 E. Randolph St., Chicago 1, Ill.

QUESTION: What is the difference between—(1) Canons of Ethics for Engineers, and (2) Rules of Professional Conduct?

REPLY: There is no fundamental difference between the rules and the canons. The National Society of Professional Engineers, as well as a number of founder societies, has adopted the Canon of Ethics for Engineers which were promulgated by the Engineers Council of Professional Development. In order to interpret the various Canons of Ethics, the National Society of Professional Engineers has issued supplementary statements which are called "Rules of Professional Conduct." These rules of Professional Conduct are listed in conjunction with certain sections of the Canons of Ethics and are no more than an amplification or an explanation of the particular canon with which the rules are indicated.*

*An opinion of the Panel on Engineering Ethics of the Division on Education and Research of the Western Society of Engineers.

Calendar of Chicago Engineering

—FEB. 28, WSE General Meeting and Dinner. Social Hour (5:15-6:15 p.m.) Dinner (6:15). Dinner Speaker (7:15-7:45). Technical Sessions (8:00). At WSE Hq.

—MAR. 1, WSE Noon Luncheon Meeting (12:00 noon). At WSE Hq.

—MAR. 2, Washington Award Dinner at Furniture Club of America.

—MAR. 8, WSE Noon Luncheon Meeting (12:00 Noon). At WSE Hq.

—MAR. 15, Civic Meeting and Dinner 6:15 P.M. At WSE Hq.

—MAR. 15, WSE Noon Luncheon Meeting (12:00 Noon). At WSE Hq.

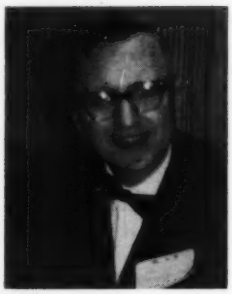
—MAR. 28, General Meeting and Dinner Social Hour (5:15-6:15 P.M.) Dinner (6:15). Dinner Speaker (7:15-7:45) Technical Session (8:00). At WSE Hq.

—APR. 5, WSE Noon Luncheon Meeting (12:00 Noon). At WSE Hq.

At the Speakers' Table — at:

Left to Right: Chairman of the Board, CTA and WSE Trustee; J. P. Donovan, J. P. Donovan & Associates and Judd Taylor, Hammond Organ Co.

H. E. Lokay, Sponsor Engineer, Electric Utility Engineering Dept. Westinghouse Electric Corp., Pittsburgh, Speaker at Session No. 1.



Bruno Staffen, applications engineer, The Hammond Organ Co., Chicago who described the reverberation device demonstrated during Dinner Program.

Samuel Radner. Speaker at No. 2 Session. Research Engineer, of the Department of Chemistry, Armour Research Foundation, who spoke on air pollution.

Howard A. Carter. WSE Program Chairman, for 1960-61. Partner in the firm of Carter and Holmquist, Technical Service.

WSE's General Meeting of Jan. 24

Dinner Program: 7:15-7:45. Provided a treat of melody along with viands to satisfy the inner man. Mr. Judd Taylor played a number of selections on a Hammond A- 100 Hammond organ to demonstrate the Hammond artificial reverberation device, with Mr. Bruno Staffen giving an explanation of its operation. Mr. Taylor is Educational and Sales Training Director of the Hammond Company, Mr. Staffen, applications engineer.

Technical Session No. 1. "Future Methods of Power Generation." Mr. H. E. Lokay, Sponsor Electric Utility Engineering Dept. Westinghouse Electric Corp., Pittsburgh, Pa. He discussed four unconventional methods of generating electric power, appearing to offer a promising future: Fuel Cells, Thermoelectricity; Thermonics; and magnetohydrodynamics. Sponsor: H. A. Budenholzer, chairman, Gas, Fuels and Combustion Section; Robert E. Kraft, chairman, Mechanical Section.

Technical Session No. 2. "Air Pollution as a National Problem and as it Relates to the Chicago Area. Mr. Samuel Radner, Research Engineer of the Department of Chemistry, Armour Research Foundation. Mr. Radner explained many of the vital aspects of this subject and discussed a number of the things that are being done or contemplated to combat this hazard. Sponsor, Hydraulic, Sanitary and Municipal Engineering Section, Sydney C. Anderson, chairman. He discussed such contaminants as dusts, fumes, mists and gases and their sources. Also, he pointed out that the medical profession considers air pollution much more than a nuisance.

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The center of United States population has been moving steadily westward and has recently reached a point near Olney, Illinois, a community served by Central Illinois Public Service Company. The trend of industry to follow population movements is illustrated by the rapid increase in industrial activity in newly developed areas. Foreseeing this trend, Central Illinois Public Service Company has engaged in an expansion program which added 100,000 kw capacity in 1958 and 200,000 kw in 1960. Continually experiencing higher and higher load requirements from large power consumers, the company's recent expansion program has truly been tuned to the future.

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Automation Speeds Paving of O'Hare International Airport Runways

Vast project typical of many others: Hangers, terminals, water mains, roadways in Chicago's extension and improvement program

Photo — by Chicago Aerial Survey

View of paving train at work on one of the eight strips which are 25 ft. wide and 3,000 ft. long.

Our cover illustration shows the dry mix batch plant which provided the four aggregate mix used in recently completed paving of runways at O'Hare International Airport. Completely automatic and designed for one man operation, it characterizes the highly automated and mechanized nature of this vast project. The plant serves paving trains like that shown in the photo on this page.

One operator controls the batch compartment gates of the batch plant. With controls preset for the required mix, material is precisely supplied to each of four compartments in a matter of seconds. Electronically controlled lights signal should any batch be over or under weight. Tolerance is held to a permitted 1½%.

Mix from the bulk plant is loaded accurately into trucks of special design utilizing four different compartments. These trucks carry the four aggregates for the mix to the paving area. Sequence of step in the total paving operation are as follows: 1) Dual drum mixer (with paving boom) receives aggregates from truck and discharge concrete for bottom of slab; (2) Vibrator spreader works bottom concrete; (3) Steel re-inforcement is placed; (4) single mixers with paving booms discharge concrete; (5) Vibratory spreader works upper concrete; (6) Finisher-screed works top surface; (7) Finisher-float smooths concrete surface; (8) Machine complete jointing operation; and (9) Curing compound is applied (not shown).

Eight strips were involved in the operations referred to here. Each strip is 25 ft. wide and 3,000 ft. long. Concrete is laid to 15 in. depth. A single strip was completed in one day. Amount of concrete handled daily was approximately 3,000 cu. yards.

Naess & Murphy are architects and engineers for the project with some 22 contractors participating. S. J. Grove & Sons, Minneapolis, Minn. own and operate the bulk plant said to be the largest of its kind. Grove handled the grading and paving operation. Over 100 pieces of equipment were used.

Carter H. Manny is project manager for Naess & Murphy at O'Hare with Walter Metshke, director of engineering in charge of all construction, Ed Plawin, chief construction engineer and Lyle Thompson, site construction engineer.

The project of extension and improvement of Chicago O'Hare International Airport comes under the direction of George L. DeMent, Commissioner of Public Works, City of Chicago: A. L. Tholin, Assistant Administrator.

Civic Group Hears Talk on Site for Chicago U. of I.

Members of WSE and their guests attending the Civic Committee Dinner on January 18th heard a most interesting report and review on the question of a site for the Chicago Campus of the University of Illinois. Speaker of the evening was John M. Ducey, Director of Social Studies, Real Estate Research Corp. Mr. Ducey has also been Deputy Director, Office of Rent Stabilization, Executive Director, National Association of Housing Officials and and Business Manager and Director of Planning for the Chicago Housing Authority. He was engaged for four years in making studies for a campus site on which the University of Illinois could establish a full four-year undergraduate post but is not presently working on the program.

In his discussion Mr. Ducey stated that based on the requirement suggested by the trustee some 80 acres would be needed. He then discussed in detail five criteria: Accessibility of site; availability of site; expandibility; cost and environment.

During the question and answer period he covered the relative standings of some of the proposed sites; Northerly Island (Meigs Field), Rail Terminal, Garfield Park, and Riverside Golf Club. He did not comment on the south west location recently proposed as he had not reviewed it professionally.

NEW ALUMINUM ALLOYS AND WHAT THEY MEAN to PRODUCTS OF THE FUTURE

Distinctive Properties
Versatility
prompting adoption in growing number of applications

by Dr. Thomas F. McCormick

For over 70 years this upstart modern metal—aluminum has been busy writing new records for industrial growth and there is no reason why it should stop now.

The trend line of aluminum consumption since the turn of the century shows that the industry has been doubling in size on an average of every ten years. Naturally there have been some ups and downs and the industry is prepared to take some of these but the over-all outlook is one of great opportunity and continued progress in production and use, as well as in increased technical knowledge of the metal's properties and new and better ways of using it.

We are cognizant of the severe competition that has generated among the aluminum producing companies and, even more severely, competition among the other metal industries as well as plastics, wood and ceramics. It is freely admitted that it is one thing to be a perennial optimist but still another to have good sound reasons for real optimism.

Before we get too deeply into the future for aluminum perhaps we should pause briefly and see just why this metal has experienced such an amazing growth in such a short period of time.

Abundant Supply

Aluminum is the most plentiful of all metallic elements in the earth's crust. Electrical power used at the rate of about 8.5 kwh per pound of aluminum produced has been developed recently from additional sources so that now we have three, (1) hydropower, (2) natural gas and (3) coal.

The metal aluminum has many unusual characteristics not the least of which is its lightness, it being one-third the weight of commonly used metals. Aluminum salts are colorless, hence no red rust stains on white buildings. The metal is non-magnetic and non-sparking. Aluminum has high thermal and electrical conductivity, and pound for pound it carries twice the electrical energy of copper. The metal has a natural bright reflective surface that can be used advantageously in many ways. Aluminum has a high degree of resistance to corrosion in ordinary atmospheres and to many chemicals, other industrial products and construction materials. It is amenable to alloying with a large number of other metals producing alloys with high strength, pleasing appearance and other desirable and useful properties.

Selection of Forms

Today the metal is available in all the normal semi-fabricated forms such as ingot, billets of various sizes and shapes, sheet and plate, foil, wire, rod, bar, rolled and extruded shapes, tube, sand, die, permanent mold and plaster castings, impacts, powder, paste and pellets,

Dr. Thomas F. McCormick is Assistant Chief Metallurgist, Fabricating Division — Research and Development Department — Aluminum Company of America. This presentation of his talk before the January 11th meeting of the Western Society of Engineers is published to implement the intent of the Jackling Bequest to the Society.

forgings and many more completely fabricated articles such as cable, and cable accessories, doors, windows, screens, siding, roofing, highway signs and ad infinitum.

Aluminum is easily worked with the standard tools, many more mechanics the world over, each year, are learning the little tricks of the trade to handle aluminum in the most economical manner. Often these tricks are merely a change in angle of a cutting tool or an additive to a lubricant.

Easily Joined

Aluminum is readily joined by adhesives, riveting, brazing, soldering, flame welding, resistance welding, cold pressure welding or by ultrasonic methods. An ultrasonic weld is particularly useful for joining foil and this recently introduced process is rapidly being applied throughout the industry.

Aluminum can be finished by all the usual methods used for other metals plus some that are uniquely applicable to this metal alone. Many mechanical and chemical finishes which are applied in addition to plating and anodizing include coloring, coating with paint, porcelain enamel, plastics, or one of the conversion type coatings as alodizing.

The aluminum industry has been established on a solid foundation of extensive research and development. Markets for products where the metal was best fitted to do the job. Certainly there is no indication that any real decrease in growth is being approached.

Now that we have a basis upon which to build our predictions for the new alloys and products of the future, let us look at some of the major areas starting with the transportation field. A prediction was made the other day as follows: "America's automotive industry will consume nearly a billion pounds of aluminum a year by 1965. Family cars of 1970 will utilize aluminum in a myriad of new chassis, body and engine applications. (By 1975, motorists may take to the air in super lightweight "transportairs," and between 1980 and 2000, man will likely own the personalized wings he's dreamed of for centuries.") These words are those of George Herrman, Alcoa's manager of transportation sales. Thus by 1970, the use of 300 pounds of aluminum per car would not be extraordinary.

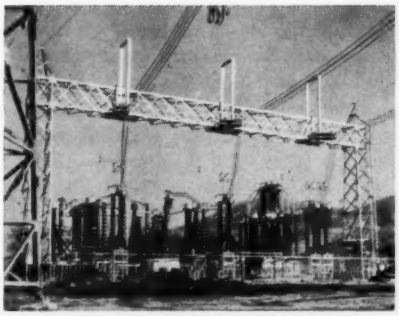
We are all aware that the use of aluminum engines in the new compact cars has indicated an important trend. The automotive industry needed assurance of uninterrupted supply and they certainly have that today. Trim, as belt railings, headlamp, bezels, grilles and many other items, have been changing to aluminum over a period of years. Now bumpers are next on the list. Initially requests were for up to a dozen pairs of bumpers for experimental cars. Suddenly there are requests for 300,000 to 400,000.

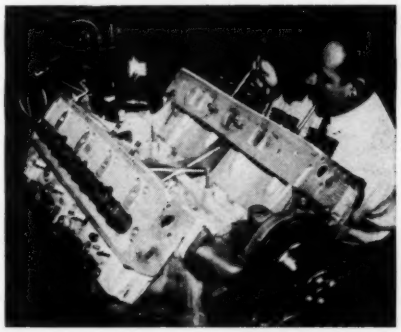
We are encountering a new word: "containerization." Apparently this means a system similar to the familiar piggybacking but without rubber-tired wheels. This is described as a system of unitizing the handling of freight as an advance over the simple idea of packing merchandise in a box, and it promises an ever-expanding market for aluminum.

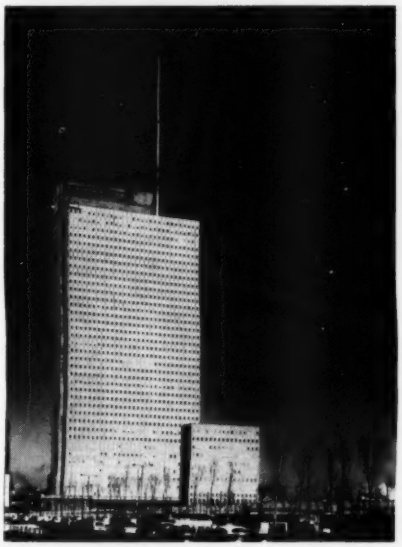
For the construction of high speed planes in the aircraft industry, the interesting recent alloys and those that are now being developed are primarily aimed at withstanding relatively high temperatures. Some of the older alloys that have been used for such purposes have been revised and improved for greater usefulness, but the most exciting new one, called X2020, contains something over 1% lithium and a substantial amount of cadmium in addition to the usual alloying elements. The aluminum-lithium alloys were chiefly laboratory curiosities until very recently when melting and ingot casting procedures capable of handling such materials were developed. Lithium, when alloyed with aluminum in the molten state, reacts very rapidly with the normal atmospheres and thus requires special protection for handling. However, the lithium addition

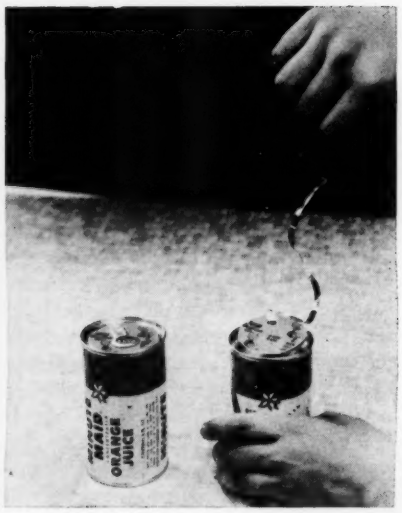
VIEWS OF ALUMINUM DEVELOPMENTS

Pictured here are (below) transmission system structures; Prudential Building Chicago utilizing aluminum spandrels and windows; aluminum test engine at Alcoa automotive research labs; and aluminum can that is opened by pulling tab that tears strip around edge.









markedly assists the aluminum alloys in maintaining high temperature strength, the mechanical property values being generally adequate at temperatures up to and exceeding 350°F. In addition, this element offers another premium, an increase of the modulus of elasticity by almost 1½ million pounds per square inch which permits substantial weight saving, particularly where compressive stresses are involved.

Marine Uses

With the exception of the small boat field, the use of aluminum for marine applications has been slow to start but now there are indications of increased activity. As evidence, the largest single application of aluminum in the world today is the superstructure of the SS United States made almost entirely of aluminum alloys for a total of approximately 5 million pounds. Another item of note is the welded aluminum elevators that will serve on the first nuclear aircraft carrier, the USS Enterprise. This ship will have four plane carrying elevators, all welded construction, each 52 ft. wide x 85 ft. long and weighing 105 tons. These represent big applications in the marine field and there is every indication that the future will show major advancements in the use of aluminum alloys. Extensive corrosion studies have shown that the aluminum-magnesium series of alloys are very resistant to salt atmospheres. Fortunately these are the alloys that are easily welded and that give high strength in the as-welded condition.

Considering specific phases of our country's defense, recent studies made on firing ranges at several arsenals have shown that the aluminum-magnesium alloys containing roughly 3-5% magnesium can give an excellent account of themselves for armor plate. Based on the results of such studies, there is a major switch to build military vehicles, such as personnel carriers, armored trucks and amphibious equipment, from welded plate used in combination with extruded shapes of the aluminum-magnesium alloys. This represents major tonnage for the future, and at least one of the aluminum alloy producers has installed a firing range and similar procedure is being contemplated by others.

Ballistic missiles of various types represent another important future use of aluminum alloys. For instance, the booster alone recently tried out for the Saturn, the most powerful missile in the free world today, uses eleven tons of aluminum and corresponding amounts are used in many of the smaller types. In addition to the structural parts of the missiles, aluminum powder has been an important component of the solid fuels used to propel such missiles, and studies are continuing to develop particle size and shape to serve this function most efficiently. An unusual application for aluminum has been the large spider-shaped cores that are inserted within the missile body prior to introduction of the fuel and that form the shape of the solidifying fuel thus controlling the burning rate. These cores have been machined from large round ingots—some weighing close to 30,000 pounds apiece.

Curtain Walls

The application of aluminum curtain wall construction to monumental buildings has been phenomenal within the past eight years. These buildings have used either anodized sheet or extrusions which, in many cases, have ben colored subsequent to anodizing using only the well evaluated and established fade-proof coloring materials or an integral type of color developed by the anodizing process itself as a result of the alloy used. These integral colors have been grays to various bronze hues and gold.

Industrial and farm buildings using aluminum roofing and siding are rapidly becoming an old story but more recently there has been important developments in the residential housing field. (Manufactured houses, some using as much as 3,000 pounds of aluminum, have met with exceptional consumer acceptance.) A variety of aluminum building products introduced in recent years, such as siding, building sheet, decorative screening, roofing and rain carrying equipment, in addition to the older uses for windows and doors and screens, are already consuming substantial quantities of metal and the full potential for these materials is hardly tapped. The exciting new material in this field is the "alply" panel. This modern sandwich material, utilizing aluminum sheets covering foamed plastic, has been combined with the age old post and beam structure method to build an attractive private home near Pittsburgh.

Aluminum transmission towers designed to carry extra high voltage powerlines across country are one of the newest volume applications. Each tower requires 15,000 pounds of metal. The initial installation was recently made for a General Electric EHV power line in Massachusetts for trial. In the structural field, it may also be noted that trailer mounted oil drilling rigs are being built and used for exploration purposes.

Much experimentation the past few years led to production now started at several locations for aluminum cable sheathing. This is being accomplished in two ways; one, by using a double cylinder press and extruding directly onto the cable through a port hole type die arrangement, and the other, by extruding very long lengths of tubes, pulling the cable into the tube and by means of a sinking die fitting the two parts snugly together. Such extruded lengths are normally 1,000 ft. But in cases 5,000 ft. lengths have been extruded. The high resistance to corrosion and good creep resistance make aluminum extremely suitable for this application.

Containers

The big news the past year, of course, has centered around aluminum containers. For some time, varieties of motor oil, beer, tuna fish, sardines and aerosol products have been sold in aluminum cans, but 1960 brought significant breakthroughs in this potential mass market. A standout in this connection was the citrus industry's acceptance of a new composite container for frozen juice concentrates shaped like a conventional can which has a foil laminate body and aluminum ends. It is a bit early to say what this development might mean in the over-all market but the potential is indicated by the fact that 1.6 billion 6 oz. cans were used by the concentrate industry last season and it would require 6,000 tons of aluminum sheet to provide only the ends for that many containers. One of the new things in this line is the quick opening end provided by attaching a tab and scoring the aluminum end.

Several years ago when the ten billion dollar highway program was announced it became evident that here was a potential market for aluminum. Here were ripe possibilities for aluminum highway signs, railings, lighting standards, chain

(Continued on page 24)

Research Reveals Man Resists Cold Quite Successfully

In spite of misconceptions to the contrary, shivering, hairless man can get along pretty well in extreme cold. He does all right now, bundled up, sometimes in some other animal's skin, and it's quite probable, said a research scientist in New York on Dec. 2, that he "can be acclimated to the cold as adequately as he can be to heat."

Recovery from body temperatures, as low as 9° C (48° F) have been recorded, Steven M. Horvath, head of the Physiology Department, Division of Research, The Lankenau Hospital, Philadelphia, Pa., told a session of the Winter Annual Meeting of The American Society of Mechanical Engineers. "Some animal experiments indicate that under certain conditions, body temperatures can be lowered to 0° C (32° F) or even slightly lower with complete recovery even though the heart has not been functioning for some minutes," he said, so that it would seem that death is not a necessary result of very low body temperatures.

The performance efficiency of man in cold environments "is commonly accepted as being somewhat depressed," Mr. Horvath continued, but "the basis for such a concept is not entirely clear." Performance of tasks that do not require fine movements has not been found to be altered, he pointed out. "Hand or grip strength, tactile discrimination, assembly of small units and certain other tasks requiring hand dexterity have been reported to be depressed in the cold. Much of this is due to the numbness and increased stiffness of small joint movements consequent to the cold. Admittedly this reduced performance is a resultant of cold exposure but it can be prevented by proper protective devices."

Besides wrapping himself up, man can keep warm in cold climates by shivering or by the well-known means of physical exercise. Shivering can raise the body's heat production three-fold but is a rather fatiguing type of motion, said Mr. Horvath, and "complaints regarding its distressing nature are vocal and vigorous." There may be the same complaints about continued physical activity.

There is no such thing as a constant body temperature, Mr. Horvath pointed out. Variations up to 10° C are found in the human body. The temperature that scientists are interested in controlling primarily is that of the deep central areas such as heart, lungs, and brain.

Although man can suffer such cold injuries as frostbite, trench foot or chilblain, "much of the problem associated with cold injuries can be remedied by proper instruction and corrective procedures. Cold injury need not occur if proper precautions are taken," Mr. Horvath said.

And what about long-term exposure to cold? Does it increase endurance to low temperatures? Arctic and Antarctic explorers have often suggested development of an acclimation process, he went on, "but it has not been easy to separate the influence of skill or training in the use of clothing and other protective devices from the physiological factors. There is some evidence that certain local mechanisms do improve with continued cold exposure. Precise studies still must be carried out before it can be assumed that man's tolerance to cold environments can be increased by the mere fact of long-term cold exposure."

Power Conference Meets March 21-23 In Chicago

Thirty-one sessions comprising more than 100 papers will be presented at the 1961 meeting of the American Power Conference to be held on March 21-23 at the Sherman Hotel in Chicago.

Among the most important sessions will be those devoted to the problems of design and operation of two of the nation's newest and most advanced electric power stations, the Breed Station of the American Electric Power Company and the Avon Station of the Cleveland Electric Illuminating Company. These stations are of the supercritical type employing steam of very high pressure and temperature in order to secure maximum efficiency. Other sessions, devoted to the future of nuclear energy and the most promising methods of generating power from nuclear fission, will also be featured.

The meeting is sponsored by the Illinois Institute of Technology in cooperation with nine national technical societies and 14 universities. For further information, address: R. A. Budenholzer, Director, American Power Conference, Illinois Institute of Technology, Technology Center, Chicago 16, Illinois.

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The six brightest stars, in order of magnitude as seen from the earth, are Sirius, Canopus, Alpha Centauri, Vega, Capella, and Arcturus.

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U. S. Experts Aid India to Set Up Visual Standards for Mica

A team of eight mica experts and a representative of the General Administrative Services are helping the Indian government establish visual standards for mica.

The Task Force has spent many hours examining hundreds of samples received from India. This standardization effort has been undertaken to insure quality understanding between Indian producers and domestic consumers. Each sample is visually inspected and compared with a master set of mica standards. This master set of standards has been built up through the efforts of Sub-Committee IX, Section A of ASTM Committee D-9 on Electrical Insulating Materials. The master set of standards culminates years of effort in this field and is now recognized throughout the world as a tremendous step forward for the mica industry.

When a matched set of India mica samples is selected, they will serve in India as visual comparison standards much as the ASTM master set serves in the United States.

Interestingly enough, mica — whose electrical insulating properties in particular make it of tremendous value to the electronics industry—must, for the most part, be prepared for use by hand. After being mined, the mineral is cleaned, the edges trimmed, and the layers of mica split into thin sheets along natural cleavages with meticulous care. It often takes six months to train a mica splitter in the art. Attempts to develop mechanical splitters have been made, but for the most part without success.

The value of the mica depends on how free it is of minor flaws, waviness, certain stains, and other defects which impair its resistance to the flow of electricity and its temperature properties. The Task Force, in reviewing the samples sent from India, carefully passed on each sample depending on their critical eye to detect these faults in the mica. It will take several meetings of the Task Force before the samples will be framed exactly as the master set. They will then be turned over to the India Standards Institute.

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Automobiles Loaded Easily Into New German RR Car

An unusual railroad freight car has recently been exhibited here North American Car Corp. The car, called the Auto Porter was built in West Germany by the Joseph Graaff Company. It is of light weight construction and uses steel of high strength. Inasmuch as the car does not have a center sill, the side frame is designed to carry the load. Side sill is of box shape construction.

Runways at the end of the upper deck are adjustable by cranks. Incline of ramp can be reduced for loading of cars to the upper deck. A unique feature is that any number of these cars can be coupled together. This permits loading of automobiles from end of train. Bridge plates are applied between cars so that an automobile can be driven to the last car without uncoupling the cars.

The car is 119 ft. 2 in. long and is articulated in two places. In general the trucks are single axle type with pedestals, elliptical springs and clasp brakes. Wheel diameter is 28 in.

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The first patent for a refrigerating machine was granted in 1851 to Dr. John Goire of Apalachiola, Florida, according to patent records.

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Small business firms received 18.3 per cent of the prime government contracts awarded during fiscal 1960, according to the Small Business Administration's semi-annual report.

Electronic Telephone Central Office Tested by Morris, Ill. Customers

At Morris, Ill., late last year, a customer trial of the world's first electronic telephone central office was started by Bell Telephone Laboratories and Illinois Bell Telephone Company.

Developed by Bell Laboratories, it is the first system which performs electronically all the functions in handling of telephone calls. This totally new system will make possible a variety of new services which will double the flexibility and hence the potential value of each customer's telephone."

Memory System

Through the use of tiny gas tubes, a vast memory system, and thousands of transistors and other solid state devices, which operate in millionths of a second, ECO permits Morris trial users to: use home extension phones as intercoms, simply by dialing two digits; reach frequently called numbers by dialing only two digits instead of seven; have incoming calls routed to another phone when the original called line is busy; dial a code which causes all subsequent incoming calls to be automatically transferred to any other number. (For example, to a friend's home if you went there for the evening.)

Other new services, expected to be introduced after the trial is underway, will permit many of the trial customers to allow a third party to be called into an existing telephone conversation and have an immediate connection to a busy line as soon as the line becomes available.

Information gained from the Morris trial will tell not only how ECO performs, but it will also give an insight into which of the new service features telephone users prefer. Telephone engineers are now investigating ways to provide some of these new services through existing telephone systems.

The trial will also present an opportunity to study the kinds of maintenance activity and the number of people needed to operate and maintain the new exchanges. During the trial, the Morris ECO will be operated jointly by Illinois Bell and Bell Laboratories.

Quiet Operation

In appearance, ECO has little in common with present exchanges. The long, high racks of equipment and the noisy chatter of relays are gone. Instead, there are several rows of neat gray cabinets filled with thousands of plug-in packages of electronic components. The switching network, made up of 23,000 tiny, neon-filled tubes goes about its work quietly, with only a bright red glow to show which tubes are operating.

One of the keys to the success of the ECO is that it uses stored program control to perform its job—that is, each action of the machine is determined by instructions stored in its memory.

The difference between ECO's stored program control and present systems can be simply illustrated by the two different ways a student can solve a square root problem. One way is by a series of logical steps—pointing off two places, etc. The other way is by looking up the answer in a book of square root tables.

Looks Up Answers

Existing exchanges use the first method to work out the detailed logic of each telephone call, item by item. The ECO, on the other hand, solves many of its problems by "looking up the answer in the book." In this case the "book" is information—2,250,000 bits—stored on photographic plates in the machine's memory, telling it what to do in any situation.

Because of ECO's extreme flexibility, it is capable of offering new and different services.

The ECO performs its work with such speed that it has enough "spare" time to continually check its own circuits. When it discovers a fault, it locates and diagnoses the trouble and, in some cases, even makes the necessary corrections. If the fault can't be corrected by the machine, it writes out in detail on a teletypewriter what the trouble is, adding the month, day, hour, and minute of the malfunction. Then the repairs are made by a member of the ECO staff.

Although some of its basic theory has been known for many years, ECO became feasible only with the invention of the transistor and other semiconductor devices, and with the development of high speed, high capacity memory systems.

Solar Cell Batteries Available to Hobbyists

Solar cell batteries are now available for home hobbyists. Solar cell modules, each containing five shingled, silicon solar cells, are self-contained power generating units that may be used in combinations to power radios, relays, or automatic switching devices. Terminals and battery polarity markings are located on tabs at the end of each plastic case.

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Graduating Engineers Favored in '61 Employment Programs

according to survey

This year's college seniors will find a general "tightening up" in recruiting effort by U. S. business and industry. The graduating engineer, however, will continue to be in great demand according to the 15th Annual College Employment Survey, conducted by Frank S. Endicott, Northwestern's director of (job) placement.

The survey reported on data from 210 firms across the nation.

It showed that the companies plan to hire 6 per cent more engineers than they did in 1960 but that they will employ 3.2 per cent fewer men with other types of training, mostly non-technical.

In spite of this, however, starting salaries for graduates with bachelor's degrees will continue to rise.

The reporting companies said they planned to pay an average of $520 a month to the starting engineers of 1961. This amounts to a 2.5 per cent increase over 1960 starting salaries, the survey showed.

This year's report also showed that in a survey of salaries for graduates who were hired five and 10 years ago, the engineer continued to hold the edge. Previous surveys had indicated that the engineer's salary advantage was lost by the 10th year.

Records of the reporting companies showed this year, however, that the engineering graduate hired in 1955 started at an average salary of $371 a month and is now making an average of $682 a month, compared to $337 and $620 for the general business graduate over the same period.

In addition to a general leveling off in hiring for 1961, the survey showed a clear upswing in a trend toward the centralization of college recruiting.

A total of 95 of the reporting companies indicated that they have changed their recruiting operation during the past five or six years. Of these, 52 firms said they have moved toward more centralization in recruiting, giving more responsibility to their central personnel management staff. Only 16 of the companies reported an opposite trend where more authority was given to department heads or field supervisors.

Offer New Grade Control for Bituminous Paving

Announcement has been made of a new automatic grade control for bituminous paving. It is especially designed to maintain grade level automatically from an accurate base, wire, form, or other device.

The revolutionary control is available for all bituminous paver finishers equipped with suspended screed and hydraulic power source. Simplicity of the accurate and versatile control eliminates complicated electronic and mechanical adjustments, or components. Applications include: Short shoe adaptation for joint matching of a previously laid mat to the mat being placed without critical operator control. Use with a roller follower device for pre-determined grade information from an accurately placed rail or steel form. Long shoe adaptation to average previously cut grade variations. This application should prove particularly useful where it is necessary only to eliminate or average out small grade imperfections. Use with a micro-switch proximity device to obtain grade information from a previously run music wire grade determinate. The control is a development of Blaw-Knox Co.

Speaker at Feb. 28th Dinner to Tell How "Univac Catches All"

The Dinner Program for the February 28th General Meeting will present Mr. L. W. Olson, Supervisor of Data Processing, Municipal Court of Chicago, Traffic Violations Bureau. He will discuss how recently installed equipment keeps track of infractions under the title "Univac Catches All!"

As previously announced, the two technical sessions are: "What's Ahead for the Iron Blast Furnace" with Prof. Thomas L. Joseph, Metallurgical Engineering, University of Minnesota and a discussion by Roger H. Hildebrand and John P. Fitzgerald, both of the Particle Accelerator Division of Argonne National Laboratories, of the particle accelerator now under construction.

Dry Bulk Transporter Uses Special Vessels

Highway Trailer Industries is now producing at its Edgerton, Wis. plant a dry bulk transporter featuring a pneumatic unloading system. It discharges at the rate of 5 to 8 barrels per minute. Storage chambers of sperical design are furnished in capacities required up to a total of 85,000 lb. It is well adapted to carrying cement, chemicals and other bulk commodities. The spherical-shaped all-welded vessels are made in capacities of 300, 340 and 400 cu. ft. capacities.

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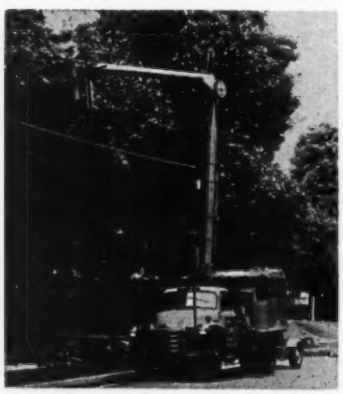

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Armour Research Aids Ammunition Progress

A major advance in ammunition design has been made with the development of a combustible cartridge case—one that burns completely when fired in a gun, the Department of the Army has announced.

Scientists at Armour Research Foundation were instrumental in designing the new shell material under a contract with Picatinny Arsenal and the Ballistic Research Laboratories.

The casing is designed primarily for use in tank guns, although the ultimate aim is for its use in all Army guns. It eliminates the need for expensive brass shell cases and lightens the weight of each shell. It is almost 10 times lighter than a conventional brass case (depending on ammunition caliber), and is expected to lead to improved storage, shipping and handling, and less gun crew fatigue.

Unlike conventional cases, it will not explode if hit by bullets or shell fragments, and it is less susceptible to damage in handling, such as dents and scratches.

The new casing not only minimizes gases released from the fired ammunition but leaves no residue in the gun tube after firing which could cause premature detonation of the succeeding round.

In addition, it will hep solve two nuisance problems of tank firing: the litter of hot spent cases on the tank fighting compartment floor, and noxious gases released inside the turret after each firing.

Composition of the new shell casing, an ARF development, is classified. The new shell case was developed after more than five years of extensive research and engineering.

Tree Rings Reveal Areas With Most Cloudless Days

Tree ring research—designed to gather information on cloudiness during the past 300 years in the Cloudcroft area of New Mexico—is being conducted by The University of Arizona's Laboratory of Tree Ring Research for the U.S. Air Force's Research Division.

The information will be used as a factor to determine the location of observatory facilities by the Air Force.

On the basis of tree ring growth records, it was deduced that the Kitt Peak area had been relatively free from cloudiness during the last few centuries—and should have low cloud incidence in the years to come.

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Method of Shipping Girders Cuts Cost Of I. I. T. Building

Method of shipping and handling steel girders on arrival at point of use was a major factor in rapid completion of the new Student Union building at Illinois Institute of Technology. Vierling Steel Works, Chicago, fabricated the steel girders which measure 160 ft. long, 5 ft. deep. Each girder is supported by two concrete columns which are set in cassions. Girders were shipped to the job in three sections. They were then welded into one unit and positioned on the columns, saving time and labor and eliminating problems often encountered in connection with girders of this size. Skidmore, Owings & Merrill are the architects-engineers of the building with Power Construction, Inc., the general contractors.

May Report Radiation Just Like Weather Says Inventor of New Counter

Evaluation of the radiation count in a given locality at a given time requires apparatus specially designed for this purpose. Such a piece of equipment was recently designed and built for a Midwestern University by the Rempe Company of Chicago.

Essentially, the equipment is similar to a dehumidifier in that it collects moisture from air flowing over cooling coils. The accumulated liquids are collected and laboratory tested for radiation particles. For statistical and scientific purposes, the radiation count is of growing importance, and it is conceivable that weather bureaus in each city will eventually indicate the radiation count in daily papers just as they now report temperature and pollen count.

Known as an Atmospheric Radiation Collector, the equipment consists of an internal fin coil across which air is directed at a minimum of 400 CFM. The air is passed over the coil four times before leaving the chamber thru an exhaust duct. The apparatus is capable of removing a minimum of one quart of water per 24 hours, 360 days per year.

Because of this requirement, it was necessary to design the evaporator with two circuits. The upper circuit is connected to an individual compressor and maintains a temperature of minus 35 degrees in the coil. The unit must be capable of removing moisture from the air during the winter when it is introduced at temperatures as low as minus 10 degrees. Two 1000 watt electric heaters serve the purpose of defrosting the coil at intervals during the winter so that the mosture is removed from the fins and tubes and taken out of the unit at the bottom. The lower section of the coil has its own compressor and is designed for summer operation at 35 degrees coil temperature when air is available at temperatures up to 90 degrees. The cabinet and all parts other than the tubing in the coil are aluminum. The blower is designed to work against a static pressure of 1″ water.

Mr. Arthur Vogel, General Manager of the Rempe Company, designed the unit. He believes that this may be a forerunner of similar and more sophisticated coil designs to handle the complexities of radiation and other space technology problems.

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ENGINEERS AID DEVELOPMENT OF HEART SURGERY EQUIPMENT

Joint effort with Chicago Heart Association initiated with field studies last December

L to R: Dr. Geza de Takats, Chairman of the Cardiovascular Surgery Committee of the Chicago Heart Association, Howard A. Carter, WSE, and Donald E. Erickson, 1961 Compaign Heart Fund General Chairman.

Medical knowledge and engineering know how is working together to develop new and more efficient medical equipment for heart patients. The announcement was made recently by Dr. Willis J. Potts, Chicago Heart Association President.

The move, unprecedented in voluntary health organizations, was initiated by the Association's committee on cardiovascular surgery.

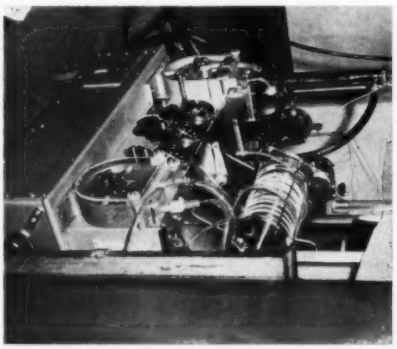
Committee chairman is Dr. Geza de Takats, Clinical Professor of Surgery, University of Illinois.

Serving on the engineers committee are 25 prominent engineers from Western Electric, Carter Holmquest Technical Service, American Medical Association, Du Pont, Chicago Technical College, Borg Warner and Morton Chemical Co.

First problem they will tackle is a study of current equipment used in open-heart surgery.

Toward that end a systematic group of field visits to medical institutions has begun. These institutions are all either using or developing heart-lung apparatus —which is necessary to open-heart surgery.

Raymond M. Restivo, Program Representative, states that first of the visits was held Dec. 8, at the experimental lab,



A current type of heart-lung apparatus which takes over for heart and lungs during open heart surgery.

Presbyterian-St. Lukes Hospital and was conducted by Dr. de Takats and hospital staff members, Dr. Egbert Fell and Dr. Milton Weinberg.

On the tour the engineering group observed an open-heart operation and were able to ask questions and examine the equipment while in actual use.

Project coordinator of the engineering group is LeRoy J. Ryan who heads the S.A.V.E. organization of the Illinois Bell Telephone Co., which, as a public service, aids medical researchers and physicians.

The group is currently being divided into specialized committees which will act in advisory capacity to the cardiovascular surgery committee.

Members of the engineers committee are C. S. Barrett,* Western Electric; Howard A. Carter,* Carter & Holmquest, who is program chairman of W. S. E.; Edward G. Dunn,* Ernest A. Ewers,* L. E. Harrington, R. M. Hoffman,* all of Illinois Bell; Harold J. Holmquest,* Carter & Holmquest; J. W. Hoppesch,* Kenneth J. Howard,* both of Illinois Bell; Dr. Frederick T. Jung, AMA; Clifford Kornegger, Illinois Bell; Howard Levin,* Western Electric; William T. Larner,* Illinois Bell; M. S. Mercer, Western Electric; W. B. McCreary, Jr.,* Claude A. McJohnston,* Alfred E. Petrie,* J. R. Shields, L. L. Swan and Robert J. Woolsey,* all of Illinois Bell; Ray Seven, Morton Chemical; Harry Venema, Borg Warner; Austin B. Wilder, Du Pont; and R. S. Ziehm,* Chicago Technical College.

**WSE Members*

Charles L. Barker Speaks On "Man In Space"—Feb. 23rd

Charles L. Barker will speak on "Man Into Space" at the Chicago Engineers Week Banquet on Thursday, February 23rd at McCormick Place, Lakefront Banquet Hall, 23rd & Outer Drive, Chicago. Mr. Barker is Dr. von Braun's Deputy Chief in charge of the Future Projects Design Branch of the Structures and Mechanics Division at the George C. Marshall Space Flight Center (National Aeronautics Administration, Huntsville, Alabama. He will talk about the Saturn Space Vehicle and the program to get man into space.

Tickets $6.00 per person. Information available from chairman H. Hansen, 922 Sherwood Drive, La Grange Park, Ill. Office Telephone: RA 6-3451.

Football is answer

A football plays an important part in an oil company's oilfield waterflood project, reports Petroleum Week, McGraw-Hill publication. The company found a football an effective answer to a vibration problem in an injection pump. The ball, in a steel jacket on one side of the pump, flexes with the pump pulsations, thus absorbing the sharp kick of water under pressure.

Obituaries

The Western Society of Engineers regrets to announce the recent passing of two of its members.

Joseph D. Stockton, vice president Illinois Bell Telephone Co., died last November 13th. He has been an affiliate member since 1954. Mr. Stockton was long a resident of Evanston, Ill. He was 46.

Harold L. Folley, a member of WSE since April, 1959 died January 24th. Mr. Folley, who was 54, had for several years been associated with Western Industries, Inc. as a signal engineer. Previously he had been connected with Illinois Building, Springfield, Ill., and Chicago & Illinois Railway Co.

Applications

Ronald L. Waller, 4228 N. Keystone Av., attending Illinois Institute of Technology.

William S. Barrett, Development Engineer, Western Electric Co., Inc., Hawthorne Station.

John K. Sedore, Distribution Engineer, Village of Winnetka, Village Hall, Winnetka, Ill.

Carl F. Roth, Regional Engineer, Structural Clay Products Institute, 228 N. LaSalle St.

E. Alfred Picardi, Chief Struct'l. Engr.; Skidmore, Owings & Merrill, 30 W. Monroe St.

Carroll V. Roseberry, Vice Pres. & Regional Mgr., Westinghouse Electric Corp., Merchandise Mart Plaza.

William T. Wishart, Senior Regional Engr., American Institute of Steel Construction, Inc., 53 W. Jackson Blvd.

Robert Baken, Civil Engr. III, City of Chicago, Bureau of Engrg., 320 N. Clark St.

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WSE Nominating Committee Set

To the Corporate Members:

I am pleased to announce that in accordance with Article X, Section 3, of the Constitution, the Board of Direction has appointed a Nominating Committee as follows:

W. R. Marston (Board Member)
L. R. Asplund
J. P. Donovan
G. S. Hall
G. C. Harris
H. C. Hoff
G. L. Jackson

The Constitution also provides that suggestions for nominees shall be solicited in the publications of the Society.

FRED R. BRUCE
Executive Secretary

Tear Out and Return

To the Nominating Committee:
Western Society of Engineers:

I suggest the following names for consideration by your committee for offices indicated.

Officers and Trustees

President .....

1st Vice Pres. .....

2nd Vice Pres. .....

Treasurer .....

Trustee (four to be nominated)

1. .....

2. .....

3. .....

4. .....

Members of Washington Award Commission

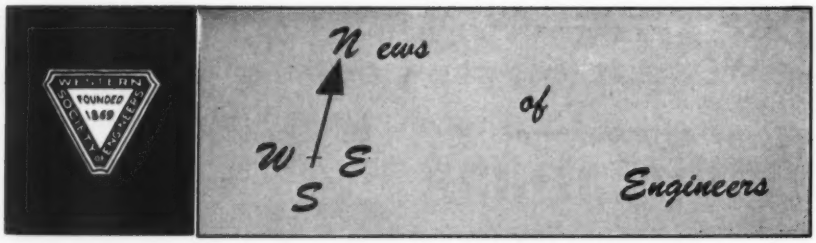
Past Pres. of WSE .....

Member not a Past Pres. or at present a member of the Board or candidate thereof .....

Signed .....

Address .....

Date .....



or: Personals of Personable People

Paul Rogers & Associates, Inc. recently announced the opening of their European office: Eugène Bonnet & Paul Rogers, Ingénieurs Conseils, Membres Société Des Ingénieurs Civils de France, 8 Vergniaud, Levallois-Perret, Paris, France. The new offices will offer full coordinating and consulting service to American industries abroad.

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Fred D. Crowther was elected president of Henry Pratt company, Chicago valve manufacturer which also does special fabrication for the nuclear and missile industries. Crowther was vice president and general manager of Chapman Valve Manufacturing company. E. B. Cottingham, president of the Pratt company, has been named chairman.

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Norman O. Kirkby has been appointed vice-president of the G&W Electric Specialty Company and will serve as general manager.

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W. F. Young has retired as executive vice-president of G&W Electric Specialty Company but remains in an advisory capacity.

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Robert C. Engemoen, veteran switchgear specialist and sales application engineer, has been named Midwest Area manager by I-T-E Circuit Breaker Company, Philadelphia, Pa. Engemoen joined I-T-E in 1950 as a field application engineer in Detroit. In 1955 he was appointed manager of the Detroit district sales office. The new Midwest area offices will be located in Chicago, Ill. I-T-E headquarters are in Philadelphia, Pa. I-T-E is a leading producer of equipment for distribution and control of electrical power.

•

J. R. Whiteside, president, Simpson Electric Company, announced the appointment of Charles R. Billman as vice president of manufacturing. Mr. Billman will be responsible for all manufacturing and associated operations in Simpson's six separate plant locations: Chicago, Aurora and Elgin, Illinois and Lac du Flambeau and Mercer, Wisconsin.

Mr. Billman, who will headquarter in Chicago, was formerly with H. K. Porter Company of Pittsburgh where he most recently served as Assistant to the President and General Manager of their National Electric Division. He is a graduate electrical engineer of Penn State University and a graduate of Harvard Graduate School of Business Administration.

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Western Society member **Arthur W. Consoer,** managing partner in the firm of Consoer, Townsend and Associates, has been honored by being elected president of the Lake Shore Club of Chicago.

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The appointment of Paul W. Coffman as general superintendent of the Riverdale plant of Acme Steel company was announced by Harry R. Sanow, vice president. Coffman, who became associated with Acme in 1950 as assistant superintendent of the cold mill division, has been assistant general superintendent of the plant since 1958.

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Richard W. Larsen, Superintendent-Safety Engineering, United States Fidelity and Guaranty Co., and a WSE member, has been elected president of the Midwest Insurance Auditors Association.

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The appointment of Dr. David W. Levinson as a metallurgical advisor at Armour Research Foundation has been announced by Dr. Donald J. McPherson, ARF director of metals research.

His appointment marks the first time that this scientific post has been utilized in metals research at ARF. Previously he served as an assistant director of metals research.

Levinson, who received his doctorate at Illinois Institute of Technology, became affiliated with the Foundation in 1952. He is a widely recognized authority and speaker on alloy systems and their potential applications, and also has written many technical papers. At one time he was an instructor in IIT's metallurgical engineering department.

•

Frederick C. Holtz and Dr. Niranjan M. Parikh have been named senior metallurgists in the metals research division at Armour Research Foundation.

Holtz became associated with the Foundation in 1956, and has worked on research programs dealing with uranium, tungsten, and molybdenum. Previously he held the position of chief metallurgist at Vascoloy-Ramet Corp. He received his B.S. degree in metallurgy at Stanford University.

Parikh (3100 S. Michigan av.) came to ARF in June 1959, and has been associated with research in fiber-metal reinforcement, zone refining of tungsten alloys, high strength powder metal parts, and dispersion hardened aluminum alloys. He received his B.S. and M.S. degrees at Alfred University in glass technology and holds a doctorate in ceramics from Massachusetts Institute of Technology. Previously he worked at the scientific laboratory of the Ford Motor Co., Dearborn, Mich.

•

Dr. Jerome B. Cohen, assistant professor of materials science at Northwestern University, is 1961 winner of the Robert Lansing Hardy Medal of the American Institute of Mining, Metallurgical and Petroleum Engineers.

The medal is given in recognition of "exceptional promise" in a man under 30 in the fields of "mineral beneficiation; extractive, physical or adaptive metallurgy; and metal processing." Benefication is reduction or concentration of materials, such as ore, for smelting.

The national award was presented to Cohen, 28, at the January meeting of the AIME Chicago section.

While a graduate student in the Massachusetts Institute of Technology, Cohen was a Kennecott Copper Co. fellow. After receiving the doctorate there in 1957, he received a Fulbright Fellowship to study with Professor A. Guinier at the University of Paris, where he worked with x-ray diffraction methods. For the 1958-59 year he was senior scientist with Avco Manufacturing Co., working on design of nose cones for the Titan and Minuteman missiles. A year ago he came to Northwestern as assistant professor.

Cohen now has five graduate students working with him, is using x-ray diffraction equipment to study such phenomena as the effect of shock waves on metals. The group is using single crystals, and subjecting them to shocks causing 5 million pounds/square inch stresses. This process changes metal structure greatly, Cohen notes.

Another group of Cohen's graduate students is studying electroplated metals, and trying to find why they are far harder than other forms of a metal. The hardness of plated metals is due to their many structural faults, the researchers believe. Studies also are underway on radiation damage, and on metal deformation at ultra-low temperatures.

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The appointment of Peter H. Wyckoff as assistant director of physics research has been announced by Dr. Leonard Reiffel, director of physics research at Armour Research Foundation.

For the past 15 years, Wyckoff has been chief of the aerophysics laboratory at Air Force Cambridge Research Center, Bedford, Mass. He served as chief scientist for the Air Force International Geophysical Year rocket program at Fort Churchill, and in 1956 successfully directed the launching of the first Aerobee and first Nike Cajun rocket launched from Canadian soil. Currently he is a member of the executive committee of the Rocket and Satellite Research Panel, and a former member of the U.S. Civil Service Board of Examiners.

Wyckoff received a B.S. degree in electrical engineering at the Carnegie Institute of Technology and his master's in electrical engineering at California Institute of Technology. He also did graduate work in nuclear physics at the University of Pittsburgh.

Henry H. Hemenway and Lionel G. Lancaster have been named vice presidents of Graver Tank and Manufacturing Co., a division of Union Tank Car Co.

Hemenway becomes vice president for research and engineering and Lancaster becomes vice president for construction.

•

Dr. Roland A. Budenholzer, Professor of Mechanical Engineering, Illinois Institute of Technology, is Director of the 23rd annual American Power Conference to be held at the Sherman Hotel, Chicago, March 21-23. A WSE member, he is Chairman of the Gas, Fuels and Combustion Section.

•

F. E. Seery, assistant vice president of General American Transportation corporation, was elected treasurer and a director of the Steel Plate Fabricators association. O. H. Lange, president of Hibben & Co., was elected a director of the association.

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Robert W. Halberg was named associate director of the automotive department of the Roy C. Ingersoll Research center of Borg-Warner corporation, Dr. Donald W. Collier, vice president in charge of research announced. Prior to becoming associated with Borg-Warner in 1947, Halberg was on the engineering staff of Chrysler corporation for seven years.

•

The Chicago chapter of the American Society for Metals held its annual "Students' Night" meeting Monday at Dohl's Morton House, on Jan. 9.

K. G. Hookanson, director of Research and development of the company, gave the evening lecture on "Hot Extrusion of Steel Shapes."

•

Charles S. Craigmile, president of Belden Manufacturing company and a past president of the National Metal Trades association, was honored by the association's Chicago branch Jan. 19 at a dinner in the Conrad Hilton hotel.

•

Four new assistant professors have been named to the physics department at Northwestern University, acting chairman Russell Fisher announced.

They are Dr. Raymond G. Ammar and Dr. Richard H. Capps, newcomers to Northwestern, and Dr. William D. McGlinn and Dr. Edward N. Shipley, formerly instructors here.

Dr. Ammar worked with one of the world's most powerful particle accelerators, the Bevatron (billion-electron volt energy) at the University of California, Berkeley. He will continue this research at Northwestern, examining "tracks" of the high-energy particles in photographic emulsions.

Previously he was a research associate at the University of Chicago's Enrico Fermi Institute for Nuclear Studies, and obtained the doctorate at Chicago.

Dr. Capps also centers his research in interactions of particles at high energies, but is interested in the theory of interactions, contrasted with Ammar's experimental interest.

He held a post-doctoral research fellowship at the Radiation Laboratory, University of California, after receiving the doctorate from the University of Wisconsin in 1955. Capps was research associate at Cornell University for the past two years.

Dr. McGlinn specializes in studies of quantum field theory. He received the doctorate at the University of Kansas in 1959.

Dr. Shipley, specializing in nuclear physics as are Ammar and Capps, received the doctorate at The Johns Hopkins University in 1958. He worked at Argonne National Laboratory during the past two summers.

•

Leo Dolkart, WSE publications committee member, was recently honored by election to the Advisory Council of the History of Technology, Announcement was made by Professor Melvin Kranzberg of the Case Institute of Technology. Members are chosen for distinguished scholarship or eminent service to technological studies. Professor Kranzberg said "the unanimous election to the council is proof of the high regard in which Mr. Dolkart is held by his colleagues in the Society."

•

William R. McConochie, chief transportation engineer, DeLeuw, Cather & Co., Chicago, will talk on "Design of Parking Lots and Garages" at the Friday, Feb. 17th session at the Traffic Engineering Conference-Engineering Institutes presented by the University of Wisconsin — University Extension and the College of Engineering at Madison, Feb. 16th and 17th.

Concurrent with its 48th anniversary, Hoffman Electric Co. honored some thirty employes at a dinner on January 28th at the Illinois Athletic Club. The group of twenty-six men and four women has served a total of 856 years for an average of twenty-eight years each. Twelve of the twenty-six men served their apprenticeships with the company. Together with other employes, and guests, some 200 were in attendance. Mrs. John M. Hoffman, widow of the founder, was guest of honor.

Fred Stocek, president and treasurer, began his uninterrupted career in 1913 as an apprentice. He is a member of the Executive Board, the Joint Arbitration Board and Chairman of the Apprentice and Training Committee of the Chicago Electrical Contractors Assn.

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The new section will develop and disseminate technical information in the field of high temperatures, and will also be prepared to give advice on the selection of appropriate materials for high temperature applications.

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Trip to Venus

It's just possible that some future astronaut at the controls of a space ship will flip the ion switch and take off for the Moon, Mars or Venus, or for a shuttle trip between orbiting space stations.

Such was the gist of a paper presented in Washington, D. C. recently at a symposium on chemical engineering in research and engineering in the Air Force during the 53rd Annual Meeting of the American Institute of Chemical Engineers.

Ions (electrically charged particles) "appear feasible for propulsion of vehicles on four types of space missions," James H. L. Lawler, of the Wright Air Development Division, Wright-Patterson Air Force Base, Dayton, O., told the symposium in his paper, Ion Propulsion Working Fluid Requirements For USAF.

The four types of space journeys are: "Earth low altitude satellite sustainer, interorbital shuttle, lunar trips and interplanetary trips such as Mars or Venus."

Ion Propulsion

Shuttle mission at present can be done much faster with chemical propellants; however, "ion propulsion will carry much larger payloads," he asserted.

"The landing and the take-off from the moon will probably be by chemical systems. The orbital missions, however, can be either chemical, ion or plasma devices. With electrical devices the time required is longer than chemical devices but the payload fraction is higher and if a reactor is to be transported to start a base this may be considered part of the payload."

Trips to Mars or Venus will require 100 days or more, he observed. "The range of impulse values needed for the four missions, depends on the mission itself, the power and the desired voltage. For long duration missions with low voltage systems almost any propellant will do and the present 'best' propellant, cesium, is satisfactory. For shorter missions with high voltage systems such as electrostatic generation propellants with a molecular weight of up to 2000 are needed. Mars-Venus are in the 150 to 650 range and up 2000 is desirable for a 200,000 volt system."

Reviews of Technical Books

Production Control

Management Guide for Production Control, by Bernard T. Lewis and William W. Pearson. Published by John F. Rider Publisher, Incorporated, New York 11, New York. Pages, 72. Price, $1.40.

This Guide provides a pattern to follow in the application of pioneer methods of production control. These are concepts to be used by all levels of management in their general relationships with the production control function and for production control specialists to use in the installation and revamping of existing systems.

The control of production is the major subject of this book. Discussed are studies of production control on a systematic basis. Elements and factors included are Organization, Forecasting, Planning, Scheduling, Performance, Reporting and Follow-up.

This Management Guide offers to production control specialists a means of applying mathematical analysis and automation to the processing of a large amount of raw data, and it offers to management in other areas an opportunity to appreciate the objectives and the means of arriving at the objectives of production control.

W.L.R.

Signal Theory

Fundamentals of Signal Theory, by John L. Stewart. Published by McGraw-Hill Book Company, Incorporated, New York 36, New York. Pages, 346. Price, $9.00.

The purpose of this unique text and reference book on the mathematics of circuit theory is to bring into focus the several mathematical techniques of importance in understanding excitation and response of linear systems.

This book is not a survey or an encyclopedia of mathematical techniques. Rather, it interrelates numerous methods and interpretations, and heavy reliance is placed on elementary principles of physics and common sense pertaining thereto. In this manner, the pathological cases which trouble the pure mathematician are by and large avoided without compromising vigor, provided that application is restricted to concepts which have definite physical reality.

Although the general contents may appeal initially primarily to electronics engineers, it is emphasized that the general organization attempts to avoid specialty prerequisites. As such, most mature non-electrical engineers, physicists, and applied mathematicians may find the work readable and useful.

Discussed in the numerous chapters are Systems and Vectors, Systems Equations, Poles and Zeros, Approximation, Operational Methods, Laplace and Fournier Transformers, Contour Integration and Complex Variable Theory.

W.L.R.

Traveling-Wave Engineering

Traveling-Wave Engineering, by Richard K. Moore. Published by McGraw-Hill Book Company, Incorporated, New York 36, N. Y. Pages, 50. Price, $11.00.

Traveling-wave engineering deals with distributed parameter systems, where the time required for some disturbance to travel from one place to another is significant.

This is the first book to be published in English, which treats the analogies between so many different types of waves. Analogies are developed early between transmission lines and electromagnetic waves, vibrating strings, acoustic waves, transverse waves in solids, heat conduction, diffusion and wave potential in quantum mechanics.

The book permits broadening traditional electrical engineering courses in transmission lines to cover other types of waves, in accordance with modern trends. Rationalized meter-kilogram-second units are used throughout. All forces are in newtons, all energy is expressed in joules and all power in watts, and all densities are in kilograms per cubic meter. The result is that most material constants presented here have been converted from different units to the M K S units.

Each new topic is taken up first for the transmission line or for electromagnetic waves in space. Examples are then drawn from transmission lines and from the various non-electrical waves. Following are some new approaches to transmission lines: Great emphases or phasor diagrams; Development of the effects of reflections on overall efficiency of the line; Development of non-electrical models for transmission lines; Direct introduction of the Smith chart without carrying out the usual transformation from other charts. A feature of the book is its integration of heretofore isolated fields of the curriculum.

W.L.R.

Flood Proofing

Flood Proofing, by John R. Sheaffer Published by the University of Chicago Press. Chicago 37, Illinois. Pages, 198. Price, $4.00.

In essence, this report represents a cooperative project of the Tennessee Valley Authority and the Department of Geography, University of Chicago. The book is a continuation and extension of the pioneering work of the TVA in the sense that it explores another possible method of mitigating flood damages and many of the techniques and economic advantages of private action to avoid flood damage where the hazard is already present.

This paper describes several available adjustments and measures to render buildings, contents, and ground less vulnerable to flood. Different elements in a flood-proofing program are described, including coatings to prevent seepage, cutoff valves on sewer lines, and steel bulk heads to prevent the entry of flood waters through doors and windows.

The primary objective of this study is to examine the possible roll of flood proofing in a comprehensive flood damage reduction program. Included in the numerous discussions are roadbed protection, deliberate flooding, utilities service, tax write-off, flood insurance, emergency measures, appraisal methods and cost of restoration. W.L.R.

Fun, Food, Philosophy at Feb. 2 Luncheon Meeting

At the first luncheon meeting of the month the speaker was Jack Craddock, Director of Public Relations NABAC (The Association for Bank Audit Control and Operation). His subject was "Human Relations and Greater Profit." Here, Mr. Craddock (center) continues his discussion, after lunch, with George C. Harris, Noon Luncheon Committee Chairman and J. P. Donovan of J. P. Donovan & Associates.

New Aluminum Alloys And What They Mean To Products Of The Future

(Continued from page 10)

link fence, bridges, guard railings and signal systems. The products to fit these applications have been developed and are now starting in mass production. For instance, the highway bride rail made of 4 in. to 5 in. aluminum tube has now been specified in 44 states.

Several new processes recently developed give every indication of being a boon to the further use of aluminum. Combination forging and extrusion methods have been studied to produce large closed end containers open the possibility of broad application in the field of missiles and rockets.

A type of reverse quenching which has been termed thermo-mechanical has been used for intricate forgings to minimize internal stress and permit machining without warpage. In the normal heat treating process quenching in cold water from temperatures just below 1000°F develop relatively high internal stresses in the parts. These can be relieved by cooling the part to an extremely low temperature and then quenching upward in live steam.

Continuous casting of fabricating ingot has been a familiar method for the aluminum alloys for many years, but recently processes have been developed for casting directly and continuously to strip thicknesses so that fabrication to sheet may be completed with very little work. This offers major fabricating cost reductions and will improve the market possibilities for aluminum alloy strip sheet products.

Equipment recently developed for continuously heat treating or annealing strip sheet provides material with finer grain size, more uniform properties and excellent surface finish free of excessive oxidation, in addition to decreased costs.

In recent times, equipment for use in the aluminum industry is impressive because of a marked change in size and this follows for the products as well. The fairly recent origin of 14,000 ton extrusion presses, 50,000 ton forging presses and large mills that roll plate to 7 in. thick, 12 ft. wide and 90 ft. long have opened up new applications for aluminum. This has made possible marked reductions in the cost of aircraft wing assemblies and similar products by eliminating much of the joining previously necessary. An intriguing possibility along this line recently announced was a submarine to be manufactured from large tubular shapes of aluminum alloy.

In the field of new alloys, X2020 was previously discussed, but there are a number of others that indicate potential application. The newly announced Screw Machine Alloy 6262 should be a suitable companion for the old standby, 2011, and used in those applications where resistance to corrosion or a bright finish after anodizing are prime requisites.

In the casting field, the Hypereutectic AL-SI Alloy X392 represents a marked improvement in wear resistance while retaining good castability and machining characteristics. It should find many uses for such things as cylinder liners, cylinder blocks, brake drums, clutch plates, sheaves and pulleys.

Occasionally we are reminded of that universal law that states phenomenal growth starts slow, then rises steeply but eventually, sometime, must level off. We are not attempting to rewrite that law but with this unique modern metal we have not approached the upper or level part of the growth curve, nor do we see it in the foreseeable future.

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Illinois office —
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MEMBERS OF THE SOCIETIES SHOWN ABOVE MAY PUBLISH FREE ADVERTISEMENT ON THIS PAGE BY REGISTERING AT THE NEAREST E.S.P.S. OFFICE. A WEEKLY BULLETIN OF POSITIONS OPEN IS AVAILABLE BY SUBSCRIPTION AT $4.50 A QUARTER.

PLACEMENT FEES: THE SERVICE IS OPERATED ON A CO-OPERATIVE BASIS, WHEREBY THOSE ACTUALLY PLACED IN POSITIONS BY THE SERVICE PAY A FEE IN ACCORDANCE WITH THE ESTABLISHED PLACEMENT FEE RATES, WHICH IS 6% OF THE ANNUAL SALARY TO MEMBERS AND 7% OF THE ANNUAL SALARY TO NON-MEMBERS.

POSITIONS AVAILABLE

This page is published to implement the intent of the James H. Brace bequest.

C-8469 SR. ELECTRICAL DESIGN ENGR. BSEE Supv. Jr. EE's in elect. engrg. assignments & be resp. for compiling fast & accurate tech. proposals & complete design of elect. eqpt. used in hydraulic, pneumatic & elect. ground support eqpt. Must know military specs. associated with elect. components & wiring. Power option preferred for a mfgr. of test eqpt. sal. $9/10,000 loc. Chgo., employer will negotiate the fee.

•

C-8470 GEN'L. SALES MGR. ELECT. age 40-45; To assume gen'l. sales mgmt. for complete line of AC & DC motor mfgred. in Europe. Will be resp. for engrg., application & sales. Good potential, loc. Hdqrs. Chgo. sal. open, employer will negotiate the fee.

•

C-8472 MACHINE DESIGNER Grad. ME age to 45; 3+ yrs. exper. in automatic or packaging mach'y. design. To design experimental machine for the mfgr. of light steel strapping, sal. to $9,000 dep. on exper. loc. Chgo., employer will pay the fee.

•

C-8480 ADVERTISING ACCOUNT EXECUTIVE, PUBLIC RELATIONS BSEE, ChE, ME; Plan & execute public relations programs for engrg.-oriented client firms, incl. writing gen'l. & tech. news releases, tech. papers, feature articles. Supv. press tours, customer house organs. Maintain active liaison with client mgmt. & engrs. & with tech. magazine editors, for a public relations agency, sal. $7500/15,000 loc. Chgo., employer will pay the fee.

C-8482 SALES APPLICATION ENGR. Grad. ME or EE age 26-30; 2+ yrs. exper. in field, application or sales engrg. Abt. 50% of time will be spent traveling promoting & training new distributors for the use of special lighting items & vapor proof lighting systems for the petroleum industry. Balance of time will be in office handling tech. correspondence & inquiries by telephone. Good potential for a mfgr. sal. up to $7500+ expenses, loc. Hdqrs. Chgo., employer will pay the fee.

•

C-8489 STRUCT. STEEL & REINF. CONCRETE DESIGN Grad. CE 5+ yrs. exper. in steel & reinf. concrete design of industrial & institutional bldgs. & superstructures for a consultant sal. $8400/9600 dep. on exper. loc. Chgo., employer will pay the fee.

ENGINEERS AVAILABLE

ENGRG. MGMT. BS-Physics 35; 8 yrs. comprehensive engrg. exper. 2 yrs. diesel engine design & devel., 2½ yrs. engrg. for resistor mfgr., 2½ yrs. statistical quality control, 1 yr. acoustical engrg. for noise control. Chgo. Area only. MW-2079

•

CHEM. PLANT MGMR. BS-Chem. minor-engrg; 42; 10 yrs. plant mgr. of chem. specialty company; 6 yrs. quality control & devel. chem. Currently resp. for plant layout, maint., mfg., purchasing & personnel. $10/12,000. MW-376

CIVIL ENGR. (142 hrs. toward CE degree) 36; 1½ yrs. exper. timber design, consulting & promotional work; 1½ yrs. arch. drafting & design & field supv., 5 yrs. struct. drafting & some design. $7800+, loc. Chgo. Area. MW-377

•

DESIGN and/or DEVEL. ELECTRONICS BSEE 28; 1 yr. with pneumatic temp. control company. Functioned in design, sales & as project engr. $7,000. MW-378

•

MECH. ENGR. DESIGN, CHEM. PROCESS PLANT LAYOUT & INSTALLATION BSME 49; 5 yrs. plant mech. process engr. layout & installation; 9 yrs. machine design—heavy earlier—petroleum lab., research, lubrication $7500 Midwest. MW-379

•

C-8483 STRUCT. ENGR. Grad. age 28-36; 3+ yrs. exper. in struct. component design. Act as consultant for service organization. Work with consultants, mfgrers. & engrs. on struct. component design for box beams, etc. Good personality. Cons. customer contact sal. $7500/8400 Chgo. Hdqr., employer will pay the fee.

•

C-8484 FIELD ENGR. Grad. CE age 26-40; 2+ yrs. exper. in concrete field construction work. To assist sales dept. handling engrg. problems of customers, read & check blue prints & make recommendations & obtain greatest use of eqpt. Work involves both office & field work. Openings in Los Angeles, New York City area & Chgo. for a mfgr. of concrete forming eqpt. sal. abt. $7500 + fringe benefits, employer pays fee.

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Ion Propulsion

Shuttle mission at present can be done much faster with chemical propellants; however, "ion propulsion will carry much larger payloads," he asserted.

"The landing and the take-off from the moon will probably be by chemical systems. The orbital missions, however, can be either chemical, ion or plasma devices. With electrical devices the time required is longer than chemical devices but the payload fraction is higher and if a reactor is to be transported to start a base this may be considered part of the payload."

Trips to Mars or Venus will require 100 days or more, he observed. "The range of impulse values needed for the four missions, depends on the mission itself, the power and the desired voltage. For long duration missions with low voltage systems almost any propellant will do and the present 'best' propellant, cesium, is satisfactory. For shorter missions with high voltage systems such as electrostatic generation propellants with a molecular weight of up to 2000 are needed. Mars-Venus are in the 150 to 650 range and up 2000 is desirable for a 200,000 volt system."

Reviews of Technical Books

Production Control

Management Guide for Production Control, by Bernard T. Lewis and William W. Pearson. Published by John F. Rider Publisher, Incorporated, New York 11, New York. Pages, 72. Price, $1.40.

This Guide provides a pattern to follow in the application of pioneer methods of production control. These are concepts to be used by all levels of management in their general relationships with the production control function and for production control specialists to use in the installation and revamping of existing systems.

The control of production is the major subject of this book. Discussed are studies of production control on a systematic basis. Elements and factors included are Organization, Forecasting, Planning, Scheduling, Performance, Reporting and Follow-up.

This Management Guide offers to production control specialists a means of applying mathematical analysis and automation to the processing of a large amount of raw data, and it offers to management in other areas an opportunity to appreciate the objectives and the means of arriving at the objectives of production control.

W.L.R.

Signal Theory

Fundamentals of Signal Theory, by John L. Stewart. Published by McGraw-Hill Book Company, Incorporated, New York 36, New York. Pages, 346. Price, $9.00.

The purpose of this unique text and reference book on the mathematics of circuit theory is to bring into focus the several mathematical techniques of importance in understanding excitation and response of linear systems.

This book is not a survey or an encyclopedia of mathematical techniques. Rather, it interrelates numerous methods and interpretations, and heavy reliance is placed on elementary principles of physics and common sense pertaining thereto. In this manner, the pathological cases which trouble the pure mathematician are by and large avoided without compromising vigor, provided that application is restricted to concepts which have definite physical reality.

Although the general contents may appeal initially primarily to electronics engineers, it is emphasized that the general organization attempts to avoid specialty prerequisites. As such, most mature non-electrical engineers, physicists, and applied mathematicians may find the work readable and useful.

Discussed in the numerous chapters are Systems and Vectors, Systems Equations, Poles and Zeros, Approximation, Operational Methods, Laplace and Fournier Transformers, Contour Integration and Complex Variable Theory.

W.L.R.

Traveling-Wave Engineering

Traveling-Wave Engineering, by Richard K. Moore. Published by McGraw-Hill Book Company, Incorporated, New York 36, N. Y. Pages, 50. Price, $11.00.

Traveling-wave engineering deals with distributed parameter systems, where the time required for some disturbance to travel from one place to another is significant.

This is the first book to be published in English, which treats the analogies between so many different types of waves. Analogies are developed early between transmission lines and electromagnetic waves, vibrating strings, acoustic waves, transverse waves in solids, heat conduction, diffusion and wave potential in quantum mechanics.

The book permits broadening traditional electrical engineering courses in transmission lines to cover other types of waves, in accordance with modern trends. Rationalized meter-kilogram-second units are used throughout. All forces are in newtons, all energy is expressed in joules and all power in watts, and all densities are in kilograms per cubic meter. The result is that most material constants presented here have been converted from different units to the M K S units.

Each new topic is taken up first for the transmission line or for electromagnetic waves in space. Examples are then drawn from transmission lines and from the various non-electrical waves. Following are some new approaches to transmission lines: Great emphases or phasor diagrams; Development of the effects of reflections on overall efficiency of the line; Development of non-electrical models for transmission lines; Direct introduction of the Smith chart without carrying out the usual transformation from other charts. A feature of the book is its integration of heretofore isolated fields of the curriculum.

W.L.R.

Flood Proofing

Flood Proofing, by John R. Sheaffer Published by the University of Chicago Press. Chicago 37, Illinois. Pages, 198. Price, $4.00.

In essence, this report represents a cooperative project of the Tennessee Valley Authority and the Department of Geography, University of Chicago. The book is a continuation and extension of the pioneering work of the TVA in the sense that it explores another possible method of mitigating flood damages and many of the techniques and economic advantages of private action to avoid flood damage where the hazard is already present.

This paper describes several available adjustments and measures to render buildings, contents, and ground less vulnerable to flood. Different elements in a flood-proofing program are described, including coatings to prevent seepage, cutoff valves on sewer lines, and steel bulk heads to prevent the entry of flood waters through doors and windows.

The primary objective of this study is to examine the possible roll of flood proofing in a comprehensive flood damage reduction program. Included in the numerous discussions are roadbed protection, deliberate flooding, utilities service, tax write-off, flood insurance, emergency measures, appraisal methods and cost of restoration.

W.L.R.

Fun, Food, Philosophy at Feb. 2 Luncheon Meeting

At the first luncheon meeting of the month the speaker was Jack Craddock, Director of Public Relations NABAC (The Association for Bank Audit Control and Operation). His subject was "Human Relations and Greater Profit." Here, Mr. Craddock (center) continues his discussion, after lunch, with George C. Harris, Noon Luncheon Committee Chairman and J. P. Donovan of J. P. Donovan & Associates.

New Aluminum Alloys And What They Mean To Products Of The Future

(Continued from page 10)

link fence, bridges, guard railings and signal systems. The products to fit these applications have been developed and are now starting in mass production. For instance, the highway bride rail made of 4 in. to 5 in. aluminum tube has now been specified in 44 states.

Several new processes recently developed give every indication of being a boon to the further use of aluminum. Combination forging and extrusion methods have been studied to produce large closed end containers open the possibility of broad application in the field of missiles and rockets.

A type of reverse quenching which has been termed thermo-mechanical has been used for intricate forgings to minimize internal stress and permit machining without warpage. In the normal heat treating process quenching in cold water from temperatures just below 1000°F develop relatively high internal stresses in the parts. These can be relieved by cooling the part to an extremely low temperature and then quenching upward in live steam.

Continuous casting of fabricating ingot has been a familiar method for the aluminum alloys for many years, but recently processes have been developed for casting directly and continuously to strip thicknesses so that fabrication to sheet may be completed with very little work. This offers major fabricating cost reductions and will improve the market possibilities for aluminum alloy strip sheet products.

Equipment recently developed for continuously heat treating or annealing strip sheet provides material with finer grain size, more uniform properties and excellent surface finish free of excessive oxidation, in addition to decreased costs.

In recent times, equipment for use in the aluminum industry is impressive because of a marked change in size and this follows for the products as well. The fairly recent origin of 14,000 ton extrusion presses, 50,000 ton forging presses and large mills that roll plate to 7 in. thick, 12 ft. wide and 90 ft. long have opened up new applications for aluminum. This has made possible marked reductions in the cost of aircraft wing assemblies and similar products by eliminating much of the joining previously necessary. An intriguing possibility along this line recently announced was a submarine to be manufactured from large tubular shapes of aluminum alloy.

In the field of new alloys, X2020 was previously discussed, but there are a number of others that indicate potential application. The newly announced Screw Machine Alloy 6262 should be a suitable companion for the old standby, 2011, and used in those applications where resistance to corrosion or a bright finish after anodizing are prime requisites.

In the casting field, the Hypereutectic AL-SI Alloy X392 represents a marked improvement in wear resistance while retaining good castability and machining characteristics. It should find many uses for such things as cylinder liners, cylinder blocks, brake drums, clutch plates, sheaves and pulleys.

Occasionally we are reminded of that universal law that states phenomenal growth starts slow, then rises steeply but eventually, sometime, must level off. We are not attempting to rewrite that law but with this unique modern metal we have not approached the upper or level part of the growth curve, nor do we see it in the foreseeable future.

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C-8469 SR. ELECTRICAL DESIGN ENGR. BSEE Supv. Jr. EE's in elect. engrg. assignments & be resp. for compiling fast & accurate tech. proposals & complete design of elect. eqpt. used in hydraulic, pneumatic & elect. ground support eqpt. Must know military specs. associated with elect. components & wiring. Power option preferred for a mfgr. of test eqpt. sal. $9/10,000 loc. Chgo., employer will negotiate the fee.

•

C-8470 GEN'L. SALES MGR. ELECT. age 40-45; To assume gen'l. sales mgmt. for complete line of AC & DC motor mfgred. in Europe. Will be resp. for engrg., application & sales. Good potential, loc. Hdqrs. Chgo. sal. open, employer will negotiate the fee.

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C-8472 MACHINE DESIGNER Grad. ME age to 45; 3+ yrs. exper. in automatic or packaging mach'y. design. To design experimental machine for the mfgr. of light steel strapping, sal. to $9,000 dep. on exper. loc. Chgo., employer will pay the fee.

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C-8480 ADVERTISING ACCOUNT EXECUTIVE, PUBLIC RELATIONS BSEE, ChE, ME; Plan & execute public relations programs for engrg.-oriented client firms, incl. writing gen'l. & tech. news releases, tech. papers, feature articles. Supv. press tours, customer house organs. Maintain active liaison with client mgmt. & engrs. & with tech. magazine editors, for a public relations agency, sal. $7500/15,000 loc. Chgo., employer will pay the fee.

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CHEM. PLANT MGMR. BS-Chem. minor-engrg; 42; 10 yrs. plant mgr. of chem. specialty company; 6 yrs. quality control & devel. chem. Currently resp. for plant layout, maint., mfg., purchasing & personnel. $10/12,000. MW-376

CIVIL ENGR. (142 hrs. toward CE degree) 36; 1½ yrs. exper. timber design, consulting & promotional work; 1½ yrs. arch. drafting & design & field supv., 5 yrs. struct. drafting & some design. $7800+, loc. Chgo. Area. MW-377

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DESIGN and/or DEVEL. ELECTRONICS BSEE 28; 1 yr. with pneumatic temp. control company. Functioned in design, sales & as project engr. $7,000. MW-378

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MECH. ENGR. DESIGN, CHEM. PROCESS PLANT LAYOUT & INSTALLATION BSME 49; 5 yrs. plant mech. process engr. layout & installation; 9 yrs. machine design—heavy earlier—petroleum lab., research, lubrication $7500 Midwest. MW-379

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